

Fourth Annual

# California Climate Change Conference

Science for Managing Climate Change in California:  
Vulnerability, Mitigation, and Adaptation

September 10 – 13, 2007  
Sacramento Convention Center



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Fourth Annual

## California Climate Change Conference

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Vulnerability, Mitigation, and Adaptation

September 10-13, 2007 | Sacramento Convention Center

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Arnold Schwarzenegger,  
Governor

September 10, 2007  
Sacramento, California

Dear Colleagues,

On behalf of the California Energy Commission, the California Environmental Protection Agency, and the California Resources Agency, we welcome you to the 4<sup>th</sup> Annual California Climate Change Conference, *Science for Managing Climate Change in California: Vulnerability, Mitigation, and Adaptation*.

The past year has seen significant developments in both the climate policy arena and the science of climate change. In the months following the passage of California's landmark legislation, The California Global Warming Solutions Act (AB 32), a number of U.S. states have joined California led initiatives to reduce greenhouse gas emissions in the Western United States and throughout the country. This past spring, Intergovernmental Panel on Climate Change's Fourth Assessment Report provided further scientific confirmation of the existence of climate change, the role of anthropogenic influences, and the resulting socio-economic risks.

As with previous conferences, this year's event again demonstrates the range and depth of California's climate change research activities and the continuing commitment to building a rigorous scientific foundation for policy. This conference will highlight the risks that climate change poses to California society and its natural systems, and strategies for addressing these risks, as well as approaches to mitigating greenhouse gas emissions.

Thank you for joining us for this exciting event, and welcome to the conference!

Sincerely,

A handwritten signature in black ink that reads "Art Rosenfeld".

ARTHUR ROSENFELD  
Commissioner  
California Energy Commission

A handwritten signature in black ink that reads "Mike Chrisman".

MICHAEL CHRISMAN  
Secretary  
California Resources Agency





## AGENDA AT A GLANCE

### MONDAY | 09.10.07

9:00 AM	Welcome and Introductions
10:30	The Economics of Climate Policy
11:45	<b>Keynote Presentation: Climate Policy Developments in the U.S.: Some Economic Political Perspectives</b>
1:15 PM	Regional Climate Modeling
2:20	Greenhouse Gas Inventory Methods and Options to Reduce Greenhouse Gas Emissions: Agricultural Sector
3:50	Identification of Vulnerability to Climate Change: Sea Level Rise
5:00	The Climate Record

### TUESDAY | 09.11.07

8:00 AM	Climate Change and Water Resources in California
10:15	Effects of Aerosols on Climate and Precipitation
11:30	<b>Keynote Presentation: The Future of California Climate from a Global Perspective</b>
1:00 PM	Tracking Greenhouse Gas Emissions
2:35	Options to Reduce Greenhouse Gas Emission: Energy Efficiency
3:50	Regional and Global Climate Issues
5:00	<b>Poster Session</b>

### WEDNESDAY | 09.12.07

8:00 AM	Carbon Sequestration
9:20	Economic Issues
10:50	2008 Scenarios Project: Impacts and Adaptation Options in California
11:30	<b>Keynote Presentation: California Ecosystems in a Changing Climate</b>
1:05 PM	Developing Coping/Adaptation Strategies at Regional Levels
2:40	The Interface Between Climate Change Science and Policy in California
4:00	Ecological Impacts

### THURSDAY | 09.13.07

8:00 AM	Stabilizing Atmospheric CO <sub>2</sub> : The Role of Technology
9:50	California: Achieving the 2050 Greenhouse Gas Reduction Goal
11:50	Closing Remarks

**MONDAY | AGENDA | 09.10.07**

General Sessions: Rooms 202-204

Luncheon Sessions: Exhibit Hall E

**WELCOME AND INTRODUCTIONS**

Session Chair: Kelly Birkinshaw (California Energy Commission)

9:00 - 9:10 AM	<b>Welcome</b> Arthur Rosenfeld ( <i>California Energy Commission</i> )
9:10 - 9:30	<b>Climate Change and California's Resources</b> Michael Chrisman ( <i>California Secretary for Resources</i> )
9:30 - 9:50	<b>Overview</b> Martha Krebs ( <i>California Energy Commission</i> )
9:50 - 10:10	<b>Q&amp;A</b>
10:10 - 10:30	<b>Break</b>

**THE ECONOMICS OF CLIMATE POLICY**

Session Chair: Alan Sanstad (Lawrence Berkeley National Laboratory)

10:30 - 10:50	<b>Climate Change, Incentives, and Technological Innovation</b> Charles Kolstad ( <i>University of California, Santa Barbara</i> )
10:50 - 11:10	<b>Frameworks for Addressing Uncertainty and Risk in Climate Policy</b> John Weyant ( <i>Stanford University</i> )
11:10 - 11:30	<b>Understanding the Gap Between Economics and Commerce in Realizing Greenhouse Gas Reductions: Lessons from the Trenches</b> Hadi Dowlatabadi ( <i>University of British Columbia</i> )
11:30 - 11:45	<b>Q&amp;A</b>

**11:45 AM - 1:15 PM | KEYNOTE PRESENTATION | LUNCH****CLIMATE POLICY DEVELOPMENTS IN THE U.S.: SOME ECONOMIC AND POLITICAL PERSPECTIVES**  
**LARRY GOULDER (STANFORD UNIVERSITY)****REGIONAL CLIMATE MODELING**

Session Chair: Daniel Cayan (Scripps Institution of Oceanography)

1:15 - 1:30 PM	<b>Downscaling Daily Precipitation and Temperature Fields Over the U.S. Using Constructed Analogues</b> Hugo Hidalgo ( <i>Scripps Institution of Oceanography</i> )
1:30 - 1:45	<b>Intercomparison of Regional Climate Models for California</b> Norm Miller ( <i>Lawrence Berkeley National Laboratory</i> )
1:45 - 2:00	<b>Detection of the Climate Change Signal in the Hydrological Record</b> Edwin Maurer ( <i>Santa Clara University</i> )
2:00 - 2:15	<b>Q&amp;A</b>



**MONDAY | AGENDA | 09.10.07**

General Sessions: Rooms 202-204

Luncheon Sessions: Exhibit Hall E

**GREENHOUSE GAS INVENTORY METHODS AND OPTIONS TO REDUCE GREENHOUSE GAS EMISSIONS: AGRICULTURAL SECTOR****Session Chair: Steve Shaffer (California Department of Food and Agriculture)**

- |             |  |
|-------------|--|
| 2:20 - 2:35 | <b>Measurement of Greenhouse Gas Emissions from Dairy Farms in California</b><br>Charles Krauter ( <i>California State University, Fresno</i> )  |
| 2:35 - 2:50 | <b>Development and Application of the Manure DeNitrification-Decomposition Model to Estimate Greenhouse Gas Emissions from Dairy Farms in California</b><br>Changsheng Li ( <i>University of New Hampshire</i> ) |
| 2:50 - 3:05 | <b>Regional Estimates of Greenhouse Gas Mitigation Potentials by Adopting Alternative Farming Management Practices in California</b><br>Stephen De Gryze ( <i>University of California, Davis</i> )              |
| 3:05 - 3:20 | <b>Developing a Geographic Information System-based Economic Model for Farmer Emission Trading</b><br>Richard Howitt ( <i>University of California, Davis</i> )  |
| 3:20 - 3:35 | <b>Q&amp;A</b>   |
| 3:35 - 3:50 | <b>Break</b>   |

**IDENTIFICATION OF VULNERABILITY TO CLIMATE CHANGE: SEA LEVEL RISE****Session Chair: Christine Blackburn (California Ocean Protection Council)**

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|-------------|--|
| 3:50 - 4:10 | <b>Identify Potential Hotspots of Coastal Erosion Along the Southern California Coast Through Numerical Modeling</b><br>Peter Adams ( <i>University of Florida</i> ) |
| 4:10 - 4:25 | <b>Southern California and Sea Level Rise</b><br>Reinhard Flick ( <i>Scripps Institution of Oceanography</i> )   |
| 4:25 - 4:40 | <b>Sea Level Rise and Tides in San Francisco Bay</b><br>Noah Knowles ( <i>United States Geological Survey</i> )  |
| 4:40 - 4:55 | <b>Q&amp;A</b>   |

**THE CLIMATE RECORD****Session Chair: Michael Anderson (California Department of Water Resources)**

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|-------------|--|
| 5:00 - 5:15 | <b>Simulation of the Mono Lake Low Stands: Verification of the Timing and Magnitude of Medieval California Drought</b><br>Nicholas Graham ( <i>Scripps Institution of Oceanography</i> ) |
| 5:15 - 5:35 | <b>The California Climate Tracker: A New Monitoring Tool</b><br>Kelly Redmond ( <i>Desert Research Institute</i> )   |
| 5:35 - 5:50 | <b>Q&amp;A</b>   |

**TUESDAY | AGENDA | 09.11.07**

General Sessions: Rooms 202-204

Luncheon Sessions: Exhibit Hall E

**CLIMATE CHANGE AND WATER RESOURCES IN CALIFORNIA**  
 Session Chair: Jamie Anderson (California Department of Water Resources)

8:00 - 8:20 AM	<b>Potential Impacts of Climate Change on Groundwater Recharge, with Implications for Groundwater and Surface Water Resources</b> Sam Earman ( <i>Desert Research Institute</i> )
8:20 - 8:40	<b>A 21<sup>st</sup> Century Observing System for California Weather and Climate: Current Plans and Future Possibilities</b> Fred Martin Ralph ( <i>National Oceanic and Atmospheric Administration</i> )
8:40 - 9:00	<b>Adaptation to Climate Change Impacts on Water Resource Systems: A Case Study of the Merced River Basin</b> Sebastian Vicuña ( <i>University of California, Berkeley</i> )
9:00 - 9:20	<b>Assessing the Risks of Shifting Climate on Water and Power Operations in the Reclamation Regions</b> Levi Brekke ( <i>U.S. Bureau of Reclamation</i> )
9:20 - 9:40	<b>California Flood Risks in a Changing Climate</b> Michael Dettinger ( <i>Scripps Institution of Oceanography</i> )
9:40 - 10:00	<b>Q&amp;A</b>
10:00 - 10:15	<b>Break</b>

**EFFECTS OF AEROSOLS ON CLIMATE AND PRECIPITATION**  
 Session Chair: Joe O'Hagan (California Energy Commission)

10:15 - 10:35	<b>Modeling the Effect of Aerosols on Precipitation in the Western United States</b> Ruby Leung ( <i>Pacific Northwest National Laboratory</i> )
10:35 - 10:55	<b>Black Carbon in Rain and Snow in the Sierra Nevada</b> Odelle Hadley ( <i>Scripps Institution of Oceanography</i> )
10:55 - 11:15	<b>Autonomous Unmanned Aerial Vehicles as a Tool for Measuring Pollution and Climate Change</b> Craig Corrigan ( <i>Scripps Institution of Oceanography</i> )
11:15 - 11:30	<b>Q&amp;A</b>

**11:30 AM - 1:00 PM | KEYNOTE PRESENTATION | LUNCH**  
**THE FUTURE OF CALIFORNIA'S CLIMATE FROM A GLOBAL PERSPECTIVE**  
**WILLIAM COLLINS (UNIVERSITY OF CALIFORNIA, BERKELEY)**
**TRACKING GREENHOUSE GAS EMISSIONS**  
 Session Chair: Richard VanCuren (Air Resources Board)

1:00 - 1:20 PM	<b>Tracking Emissions at the Continental and Global Scales</b> Adam Hirsch ( <i>National Oceanic and Atmospheric Administration</i> )
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**TUESDAY | AGENDA | 09.11.07**

General Sessions: Rooms 202-204

Luncheon Sessions: Exhibit Hall E

1:20 - 1:35	<b>Identifying Sources and Verifying Fluxes of Non-CO<sub>2</sub> Greenhouse Gases Using Ambient Measurements</b> Donald Blake ( <i>University of California, Irvine</i> )
1:35 - 1:50	<b>Tracking Land Cover Change and Greenhouse Gas Emissions in the Western United States</b> Chris Potter ( <i>National Aeronautics and Space Administration</i> )
1:50 - 2:05	<b>Designing a California Greenhouse Gas Measurement (CALGEM) Network: A Bay Area and Sacramento Valley Case Study</b> Marc Fischer ( <i>Lawrence Berkeley National Laboratory</i> )
2:05 - 2:20	<b>Q&amp;A</b>
2:20 - 2:35	<b>Break</b>

**OPTIONS TO REDUCE GREENHOUSE GAS EMISSIONS: ENERGY EFFICIENCY**  
**Session Chair: John Wilson (California Energy Commission)**

2:35 - 2:50	<b>Energy Efficiency Potential for Data Centers</b> Eric Masanet ( <i>Lawrence Berkeley National Laboratory</i> )
2:50 - 3:10	<b>Energy Efficiency Potential for Mitigating Greenhouse Gas Emissions: Findings from the IPCC Fourth Assessment</b> Jayant Sathaye ( <i>Lawrence Berkeley National Laboratory</i> )
3:10 - 3:30	<b>Energy Efficiency, California Building Energy Use, and Greenhouse Gas Emissions Mitigation for the 21<sup>st</sup> Century</b> Steve Smith ( <i>Pacific Northwest National Laboratory</i> )
3:30 - 3:50	<b>Q&amp;A</b>

**REGIONAL AND GLOBAL CLIMATE ISSUES**  
**Session Chair: Nehzat Motallebi (Air Resources Board)**

3:50 - 4:10	<b>Climate Impacts on Future Ozone Concentrations in California: Expanding the Uncertainty</b> Michael Kleeman ( <i>University of California, Davis</i> )
4:10 - 4:30	<b>Identification of Human-Induced Changes in Atmospheric Moisture Content</b> Ben Santer ( <i>Lawrence Livermore National Laboratory</i> )
4:30 - 4:50	<b>Energy Solutions to Air Pollution and Climate Change in California</b> Mark Jacobson ( <i>Stanford University</i> )
4:50 - 5:00	<b>Q&amp;A</b>

**5:00 - 7:30 | POSTER SESSION | EXHIBIT HALL E**

**WEDNESDAY | AGENDA | 09.12.07**

General Sessions: Rooms 202-204

Luncheon Sessions: Exhibit Hall E

**CARBON SEQUESTRATION****Session Chair: Douglas Wickizer (California Department of Forestry and Fire Protection)**

8:00 - 8:20 AM	<b>Terrestrial Carbon Sequestration and Emission Reduction Pilot Activities in Shasta County, California</b> Nicholas Martin ( <i>Winrock International</i> )
8:20 - 8:40	<b>Monitoring Forest Carbon in Sierra Nevada and North Coast Forests with Field Inventories, LIDAR, and QuickBird</b> Patrick Gonzalez ( <i>The Nature Conservancy</i> )
8:40 - 9:00	<b>Rosetta Resources CO<sub>2</sub> Storage Pilot Tests</b> Rob Trautz ( <i>Lawrence Berkeley National Laboratory</i> )
9:00 - 9:20	<b>Q&amp;A</b>

**ECONOMIC ISSUES****Session Chair: Anthony Brunello (California Resources Agency)**

9:20 - 9:40	<b>Impacts of Climate Variability on Flood Insurance Claims and Payouts</b> Tom Corringham ( <i>University of California, San Diego</i> )
9:40 - 10:00	<b>Estimating the Impact of Climate Change on Electricity Load for California's Utilities</b> Maximilian Auffhammer ( <i>University of California, Berkeley</i> )
10:00 - 10:20	<b>A Stochastic Framework for Analyzing Long-Run CO<sub>2</sub> Abatement Strategies</b> Alan Sanstad ( <i>Lawrence Berkeley National Laboratory</i> )
10:20 - 10:35	<b>Q&amp;A</b>
10:35 - 10:50	<b>Break</b>

**2008 SCENARIOS PROJECT: IMPACTS AND ADAPTATION OPTIONS IN CALIFORNIA****Session Chair: Guido Franco (California Energy Commission)**

10:50 - 11:05	<b>Overview</b> Guido Franco ( <i>California Energy Commission</i> )
11:05 - 11:20	<b>Impacts and Adaptation Issues</b> Dan Cayan ( <i>Scripps Institution of Oceanography</i> ), Alan Sanstad ( <i>Lawrence Berkeley National Laboratory</i> ), Amy Luers ( <i>Union of Concerned Scientists</i> )
11:20 - 11:30	<b>Q&amp;A</b>

**11:30 AM - 1:00 PM | KEYNOTE PRESENTATION | LUNCH**  
**CALIFORNIA ECOSYSTEMS IN A CHANGING CLIMATE**  
**CHRIS FIELD (CARNEGIE INSTITUTION)**

**WEDNESDAY | AGENDA | 09.12.07**

General Sessions: Rooms 202-204

Luncheon Sessions: Exhibit Hall E

**DEVELOPING COPING/ADAPTATION STRATEGIES AT REGIONAL LEVELS**

Session Chair: Amy Luers (Union of Concerned Scientists)

1:05 - 1:25 PM	<b>Applying Adaptation Principles to Conservation</b> Rebecca Shaw ( <i>The Nature Conservancy</i> )
1:25 - 1:40	<b>A Guidebook on Local/Regional Planning for Global Warming</b> Laura Whitely Binder ( <i>Climate Impacts Group</i> )
1:40 - 2:00	<b>Cities Preparing for Climate Change: A Study of Six Urban Regions</b> Jennifer Penney ( <i>Clean Air Partnership</i> )
2:00 - 2:25	<b>Q&amp;A</b>
2:25 - 2:40	<b>Break</b>

**THE INTERFACE BETWEEN CLIMATE CHANGE SCIENCE AND POLICY IN CALIFORNIA**

Session Chair: Andrew Altevogt (California Environmental Protection Agency)

2:40 - 2:50	<b>California Climate Change Research and Its Relationship to State Climate Policy</b> Andrew Altevogt ( <i>California Environmental Protection Agency</i> )
2:50 - 3:00	<b>Anticipating Tomorrow's Research Needs Today</b> Joshua Bushinsky ( <i>Pew Center</i> )
3:00 - 3:10	<b>Apples to Oranges: Bridging the Gap Between Research and Effective Policy Development</b> Julia Lave Johnston ( <i>Governor's Office of Planning and Research</i> )
3:10 - 3:20	<b>Adapting California Water Management to Climate Change</b> Mark Cowin ( <i>Department of Water Resources</i> )
3:20 - 3:30	<b>Addressing the Climate Risks Through Science/Policy Partnerships</b> Michael Mastrandrea ( <i>Stanford University</i> )
3:30 - 4:00	<b>Q&amp;A</b>

**ECOLOGICAL IMPACTS**

Session Chair: Marc Hoshovsky (California Department of Fish and Game)

4:00 - 4:20	<b>Ocean Climate and Marine Ecosystems: Indicators of Change in Structure and Productivity</b> William Sydeman ( <i>Point Reyes Bird Observatory</i> )
4:20 - 4:40	<b>A Comparison of Carbon Cycling and the Surface Energy Balance Between Native Perennial and Exotic Annual Grass Communities in Northern Coastal California</b> Laurie Koteen ( <i>University of California, Berkeley</i> )
4:40 - 5:00	<b>Dynamic Ecological Model Results</b> Lydia Ries ( <i>University of California, Santa Barbara</i> )
5:00 - 5:15	<b>Q&amp;A</b>

**THURSDAY | AGENDA | 09.13.07**

General Sessions: Rooms 202-204

Luncheon Sessions: Exhibit Hall E

**STABILIZING ATMOSPHERIC CO<sub>2</sub>: THE ROLE OF TECHNOLOGY**

Session Chair: Martha Krebs (California Energy Commission)

- |                |   |
|----------------|---|
| 8:00 - 8:30 AM | <b>Stabilization and the Role of Technology in the Near, Mid, and Long Term: Lessons from the Global Energy Technology Strategy Program (GTSP) Phase 2</b><br>Hugh Pitcher ( <i>Pacific Northwest National Laboratory</i> ) |
| 8:30 - 9:00    | <b>How Far Can We Reach with Emerging Generation Technologies at the Global Scale?</b><br>Daniel Kammen ( <i>University of California, Berkeley</i> )   |
| 9:00 - 9:30    | <b>Q&amp;A among the panelists with some questions from the public</b>  |
| 9:30 - 9:50    | <b>Break</b>  |

**CALIFORNIA: ACHIEVING THE 2050 GREENHOUSE GAS REDUCTION GOAL**

Session Chair: Laurie ten Hope (California Energy Commission)

- |               |   |
|---------------|---|
| 9:50 - 10:10  | <b>Implications of Defining and Achieving California's 80% Greenhouse Gas Reduction Goal</b><br>Steve Schiller ( <i>California Institute for Energy and Environment</i> )         |
| 10:10 - 10:30 | <b>Envisioning Clean Transportation Systems for California: Contribution to the 2050 Target</b><br>Joan Ogden ( <i>University of California, Davis</i> )                          |
| 10:30 - 10:50 | <b>Fuel Choices: The Impact of Alternative Transportation Choices on the Natural Gas and Electricity Markets</b><br>Alan Lamont ( <i>Lawrence Livermore National Laboratory</i> ) |
| 10:50 - 11:10 | <b>How Far Can We Reach with Emerging Generation Technologies?</b><br>Hal LaFlash ( <i>Pacific Gas and Electric</i> )   |
| 11:10 - 11:30 | <b>How Far Can We Reach with Energy Efficiency?</b><br>Art Rosenfeld ( <i>California Energy Commission</i> )  |
| 11:30 - 11:50 | <b>Q&amp;A among the panelists with some questions from the public</b>  |
|               | <b>Closing Remarks</b>  |



## KEYNOTE SPEAKER BIOGRAPHIES

### MICHAEL CHRISMAN

*California Secretary for Resources*

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A fourth-generation Californian and San Joaquin Valley resident, Chrisman was named California Secretary for Resources by Governor Schwarzenegger in November 2003. As a member of the governor's cabinet, Secretary Chrisman serves as his chief advisor on issues related to the states' natural, historic, and cultural resources.

In leading the Resources Agency, Secretary Chrisman oversees policies, activities, and a budget of \$6.4 billion and 16,000 employees in 25 departments, commissions, boards, and conservancies. The issues run the natural resources gamut: conservation, water, fish and game, forestry, parks, energy, coastal, marine, and landscape.

Prior to his appointment Secretary Chrisman served as Region Manager for Southern California Edison Company from 1996 to 2003. There he managed all phases of company and customer business and the political and civic activities in Edison's San Joaquin Valley service area. He served as Undersecretary for the California Department of Food and Agriculture from 1994 to 1996, during which time he led the development and implementation of sound policy for the state's agricultural industry and consumers.

In 1997, Governor Wilson appointed Secretary Chrisman to the California Fish and Game Commission, where he also served as Chairman of the Wildlife Conservation Board. From 1991 to 1994 he served at the Resources Agency as Deputy Secretary for Operations and Legislation. He was staff director of the Assembly Republican Caucus in 1991, advising members of the Legislature on environmental, water and agriculture issues. From 1986 to 1991, Secretary Chrisman served as Chief of Staff to former Assemblyman Bill Jones, specializing in agriculture, water, and environmental issues.

Secretary Chrisman holds an M.S. in agricultural education and a B.S. in agronomy and plant science from the University of Arizona. He is an owner and partner of Visalia's Chrisman Ranches, a family ranching and farming business in Tulare County.

## LAWRENCE H. GOULDER

*Stanford University*

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Lawrence H. Goulder is the Shuzo Nishihara Professor in Environmental and Resource Economics at Stanford University. He is also a Senior Fellow at Stanford's Institute for Economic Policy Research, a Research Associate at the National Bureau of Economic Research; and a University Fellow of Resources for the Future, a nonprofit environmental research firm. He graduated from Harvard College with an A.B. in philosophy and received his Ph.D. in Economics from Stanford. He has been a Stanford faculty member since 1989.

Goulder's research examines the environmental and economic impacts of regional, national, and international environmental policies. He focuses on policies to address the prospect of climate change and air pollution from power plants and automobiles. Much of his work explores how alternative environmental policy instruments such as tradable emissions allowances, emissions taxes, and performance standards can be designed to achieve environmental goals without posing significant costs on major industrial stakeholders. Goulder also is involved in developing more comprehensive national accounting methods that can better assess the long-run development prospects for various countries. His collaborators include engineers, climatologists, and biologists as well as economists. Goulder has performed environmental policy analysis for various government agencies, business groups, and environmental organizations. He has served on several committees of the U.S. Environmental Protection Agency's Science Advisory Board and was a lead author on the Third Assessment Report of the Intergovernmental Panel on Climate Change. He recently served as vice-chair of the California Environmental Protection Agency's Market Advisory Committee to the California Air Resource Board, the committee charged with proposing the design of a "cap-and-trade" system to help meet the state's targets for greenhouse gas emissions reductions.

At Stanford, Goulder teaches undergraduate and graduate courses in environmental economics and policy, and co-organizes a weekly seminar in public and environmental economics.

## WILLIAM COLLINS

*University of California, Berkeley*

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William Collins is a professor in residence in the Department of Earth and Planetary Science at the University of California, Berkeley, and a senior scientist with the Lawrence Berkeley National Laboratory (LBNL) in Berkeley, and the National Center for Atmospheric Research (NCAR) in Boulder, Colorado. He is also the head of the Department of Climate Science at LBNL. Collins graduated from Princeton University with a B.A. in physics and from the University of Chicago with an M.S. and Ph.D. in astrophysics. Prior to his move to Berkeley this year, he conducted research on the observation and modeling of the Earth's climate system at NCAR and the Scripps Institution of Oceanography in La Jolla, California.

His personal research concerns the interactions of light and heat with the Earth's atmosphere, oceans, land, and ice. Human-induced changes in these interactions represent the physical basis for global warming and climate change. He has led the development of the Community Climate System Model—one of the leading climate models used in national and international studies of global warming. Collins is a lead author of the most recent assessment of the science of climate change by the Intergovernmental Panel on Climate Change.

## CHRIS FIELD

*Carnegie Institution*

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Chris Field is the founding director of the Carnegie Institution's Department of Global Ecology, Professor of Biological Sciences at Stanford University, and Faculty Director of Stanford's Jasper Ridge Biological Preserve. For most of the last two decades, Field has worked to establish the science of global ecology. His research emphasizes mechanisms that control the carbon cycle and its interactions with climate, from the molecular to the global scale. In more than 200 scientific publications, Field and his colleagues have used diverse approaches, integrating information from plant physiological approaches, satellites, atmospheric observations, historical data, and models. They have explored local- and global-scale patterns of climate change impacts, vegetation-climate feedbacks, carbon cycle dynamics, primary production, forest management, and fire. At the ecosystem-scale, Field has, for more than a decade, led major experiments on responses of California grassland to multi-factor global change; experiments that integrate approaches from molecular biology to remote sensing.

Field has served on many national and international committees related to global ecology, including committees of the National Research Council, the International Geosphere-Biosphere Programme, and the Earth System Science Partnership. Field was a coordinating lead author for the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, with responsibility for the chapter on North America. He is a fellow of the Ecological Society of America (ESA) Aldo Leopold Leadership Program and a member of the U.S. National Academy of Sciences. He has served on the editorial boards of *Ecology*, *Ecological Applications*, *Ecosystems*, *Global Change Biology*, and *PNAS*.

Field received his Ph.D. from Stanford in 1981 and has been at the Carnegie Institution since 1984. His recent priorities include high performance "green" laboratories, integrity in the use of science by governments, local efforts to reduce carbon emissions, ecological impacts of biofuels, and the future of scientific publishing.



## SPEAKER BIOGRAPHIES

### PETER ADAMS

#### UNIVERSITY OF FLORIDA

Peter Adams is an Assistant Professor of Geological Sciences at the University of Florida. Adams has conducted scientific projects on the mechanics of sea cliff erosion, monitoring longshore sediment transport on beaches, and long-term geomorphic evolution of coasts. His research focuses on: “real-time” instrumentation of the coastal landscape to document magnitudes and rates of geomorphic processes, and numerical modeling of coastal processes. In collaboration with researchers at Scripps, Adams uses numerical models of wave transformation, sediment transport, and sea cliff retreat, to simulate coastal change in response to sea level rise and wave climate variation along California’s coast. He received his B.S. and M.S. degrees from Penn State University, his Ph.D. in Earth Sciences from the University of California, Santa Cruz, and was a post-doctoral researcher at Scripps Institution of Oceanography during 2005–2006.

### ANDREW ALTEVOGT

#### CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

Andrew Altevoigt is Climate Change Advisor in the Office of the Secretary at the California Environmental Protection Agency (Cal/EPA). Altevoigt is responsible for assisting the Secretary in coordinating the Climate Action Team and related greenhouse gas mitigation and adaptation initiatives. Prior to arriving at Cal/EPA, he spent 15 years as an academic environmental researcher. Altevoigt’s research experience includes, most recently, five years in the Civil and Environmental Engineering Department at Princeton University working on numerical modeling projects as part of the Carbon Mitigation Initiative. He also has research experience in theoretical fluid dynamics, groundwater modeling, and aquatic chemistry. Altevoigt has a Ph.D. in hydrology from the University of California, Davis, and M.A. and B.S. degrees in environmental engineering from the Massachusetts Institute of Technology.

### JAMIE ANDERSON

#### CALIFORNIA DEPARTMENT OF WATER RESOURCES

Jamie Anderson is a senior engineer with the California Department of Water Resources’ Delta Modeling group. She served as the technical lead for an ad hoc climate change work team that produced the 2006 report *Progress on Incorporating Climate Change into the Management of California’s Water Resources*. She continues to conduct research on potential impacts of climate change to the hydrodynamics and water quality of the Sacramento-San Joaquin Delta. Anderson received her doctoral and master’s degrees in Civil and Environmental Engineering from the University of California, Davis and her bachelor’s degree from Colorado State University.

### MICHAEL ANDERSON

#### CALIFORNIA DEPARTMENT OF WATER RESOURCES

Michael Anderson works for the California Department of Water Resources and is currently serving as California’s State Climatologist. He began working in the Department of Water Resources Division of Flood Management (DWR-DFM) Forecasting Section in July 2005. Anderson came to DWR after extensive graduate, post-graduate, and consulting work with Professor M. Levent Kavvas of the University of California, Davis, in the area of hydroclimate modeling and monitoring. He received his Ph.D. in civil and environmental engineering from UC Davis, with a minor in atmospheric science. Anderson received his M.S. in civil and environmental engineering from UC Davis, and he received his bachelor’s degree in civil engineering from Colorado State University.

### MAXIMILIAN AUFFHAMMER

#### UNIVERSITY OF CALIFORNIA, BERKELEY

Maximilian Auffhammer is an assistant professor in the departments of Agricultural and Resource Economics and International Studies at the University

of California, Berkeley. One area of research interest is the construction and evaluation of forecasting models of energy and carbon related sequences. A second main research interest is the estimation of climate change and indirect aerosol impacts on agriculture. His paper co-authored with Jeffrey Vincent (Duke University) and V. Ramanathan (Scripps Institution of Oceanography/UC San Diego) was awarded the 2006 Cozzarelli prize by the Proceedings of the National Academies of Sciences. Auffhammer received his Ph.D. in economics from UC San Diego.

### **LARA WHITELY BINDER**

#### **UNIVERSITY OF WASHINGTON**

Lara Whitely Binder is an outreach specialist at the University of Washington's Climate Impacts Group (CIG). Lara assists the CIG with its efforts to disseminate information to decision-makers on the impacts of climate variability and climate change on the Pacific Northwest and to support decision-makers in the use of this information. Prior to attending graduate school, Lara served as the Groundwater Protection Coordinator for a consortium of public and private groundwater suppliers in the greater Cincinnati, Ohio, metropolitan area. As the Coordinator, Lara developed and administered a multi-jurisdictional groundwater protection program. Lara earned her master's degree in public affairs at the University of Washington's Evans School of Public Affairs.

### **KELLY BIRKINSHAW**

#### **CALIFORNIA ENERGY COMMISSION**

Kelly Birkinshaw is the Environmental Program Manager for the Public Interest Energy Research (PIER) Program of the California Energy Commission. He is responsible for a \$82 million research project portfolio addressing energy and the environment in the areas of air quality, water resources, land use/habitat, and climate change. As part of an integrated approach to climate change research, Birkinshaw established a virtual research center for regional-specific studies. This center, known as the California Climate Change Center, has core research activities at the Scripps Institution of Oceanography and the University of California, Berkeley. He is

Deputy Director of the West Coast Regional Carbon Sequestration Partnership and has established an air quality research program at the Center for Sustainable Urban Development at UC Riverside. Birkinshaw received a B.S. and M.S. in chemical engineering from UC Davis.

### **DONALD R. BLAKE**

#### **UNIVERSITY OF CALIFORNIA, IRVINE**

Donald R. Blake is Professor and Chair of the Department of Chemistry at the University of California, Irvine. Blake has worked on a variety of atmospheric chemistry projects. The trace gases measured by his research group affect stratospheric ozone concentrations, are greenhouse gases, or participate in local and regional photochemistry. His group is known as the gold standard in atmospheric volatile organic compound (VOC) trace gas analysis and has flown on every suborbital National Aeronautics and Space Administration (NASA) atmospheric chemistry mission flown by NASA since 1988. The group is currently involved in a study to determine VOC emissions from California dairies, identifying emissions of VOCs from Asian urban areas, snow chemistry studies in Greenland, and southern California urban pollution studies, to name a few. He received his B.S. from the University of California, Los Angeles, and his Ph.D. in chemistry from the University of California, Irvine.

### **CHRISTINE BLACKBURN**

#### **CALIFORNIA OCEAN PROTECTION COUNCIL**

Christine Blackburn currently serves as a project manager for the California Ocean Protection Council. She oversees a variety of projects, ranging from analyzing potential climate change impacts along the California coast to using market-based incentives to improve fisheries management. Prior to joining the California Ocean Protection Council, Christine worked for the Ocean Studies Board at the National Academies of Science, where she managed the production of consensus reports that provided guidance to federal agencies for improved management of fisheries and fisheries data. Christine also was a staff member to the U.S. Commission on Ocean Policy, drafting sections

of the report related to science, fisheries, and ocean observing. Christine earned her Ph.D. in Oceanography from Scripps Institution of Oceanography.

### **LEVI BREKKE**

#### **U.S. BUREAU OF RECLAMATION**

Levi Brekke is a Hydraulic Engineer in the Water Resources Division at the U.S. Bureau of Reclamation's Technical Service Center in Denver, Colorado. Brekke's work activities include reservoir systems modeling, hydrologic analyses, statistical/risk analysis, technical coordination, and research involving applications of climate information to benefit Reclamation's water and power operations. Recent research has involved collaboration with the California Department of Water Resources, the U.S. Army Corps of Engineers, the U.S. Geological Survey, and Santa Clara University, exploring climate change risks for California Central Valley state and federal reservoir operations. Brekke's educational background includes a B.S.E. in Civil Engineering from The University of Iowa, an M.S. in Environmental Science and Engineering from Stanford University, and a Ph.D. in Water Resources Engineering from University of California, Berkeley.

### **ANTHONY BRUNELLO**

#### **CALIFORNIA RESOURCES AGENCY**

Anthony Brunello is deputy secretary of climate change and energy for the Resources Agency. He most recently served as a program coordinator for the U.S. Forest Service from 2005 to 2007. Brunello previously was a consultant for California Strategies in 2005 and executive director for the Tahoe-Baikal Institute from 2002 to 2005. Additionally, he served as a climate change economist for the PA Consulting Group and a senior research fellow for the Pew Center on Global Climate Change.

### **JOSHUA BUSHINSKY**

#### **PEW CENTER ON GLOBAL CLIMATE CHANGE**

Joshua Bushinsky is the State Solutions Fellow for the Pew Center on Global Climate Change. His responsibilities include researching and communicating information on state-level climate change policy, writing case studies of state climate change actions, and organizing workshops and briefings for stakeholders.

Bushinsky provides technical support to state and regional initiatives, including the Northeast Regional Greenhouse Gas Initiative and the Western Governors' Clean and Diversified Energy Initiative. He also oversaw production of the Pew Center's Climate Change 101 series of reports. Bushinsky has made public presentations worldwide on state-level climate change actions, including testimony before the North Carolina Legislative Commission on Climate Change and the California Energy Commission. Bushinsky holds a B.S. and an M.S. (energy policy and economics focus) in earth systems from Stanford University with honors in environmental science, technology, and policy. He has worked as a visiting researcher at the Energy Research Institute at the University of Cape Town.

### **DANIEL CAYAN**

#### **SCRIPPS INSTITUTION OF OCEANOGRAPHY**

Daniel Cayan is a Research Meteorologist at Scripps Institution of Oceanography (SIO), University of California, San Diego, and is also a researcher for the U.S. Geological Survey. His work is aimed at understanding climate variability and changes over the Pacific Ocean and North America. Specific interests concern impacts of climate changes on water resources and other sectors in California. Cayan heads the California Applications Program and the California Climate Change Center. Since 1996, he has served as Director of the Scripps Climate Research Division. Cayan received a B.S. in meteorology and oceanography in 1971 from the University of Michigan, and a Ph.D. in oceanography from the University of California, San Diego. He has worked for SIO since 1977 and the U.S. Geological Survey Water Resources Division.

### **CRAIG CORRIGAN**

#### **SCRIPPS INSTITUTION OF OCEANOGRAPHY**

Craig Corrigan is currently conducting research at Scripps Institution of Oceanography on the contribution of aerosols to climate change. His work involves the measurement of black carbon in air, water, and snow. He also develops and deploys miniaturized instruments for measuring aerosol and gas pollutants on small unmanned aircraft. Craig Corrigan received his Ph.D. in Chemistry from the University of California, Berkeley.

**TOM CORRINGHAM**

**UNIVERSITY OF CALIFORNIA, SAN DIEGO/SCRIPPS  
INSTITUTION OF OCEANOGRAPHY**

Tom Corringham is a third-year graduate student in the Department of Economics at the University of California, San Diego (UCSD), and a research assistant in the Climate Research Division at Scripps Institution of Oceanography (SIO). Corringham's work includes modeling the use of climate information systems in natural resource management applications and estimating the value of such information systems. Currently most of his work is terrestrial, focusing on floods and wildland fires in the western United States. Corringham is also interested in how climate events and climate change affect optimal management policies in several marine contexts, including the management of small pelagic fisheries in the California Current, the design of Marine Protected Areas, and the conservation of endangered species and of critical habitats such as reefs and coastal wetlands.

**MARK COWIN**

**DEPARTMENT OF WATER RESOURCES**

Mark Cowin was appointed Deputy Director for Regional Water Planning and Management of the California Department of Water Resources (DWR) in 2007. His primary responsibilities include implementing Integrated Regional Water Management, coordinating DWR's efforts related to climate change, and updating and implementing the California Water Plan. Prior to this assignment, Cowin served for five years as Chief of DWR's Division of Planning and Local Assistance. As Division Chief, Cowin oversaw development of the California Water Plan Update 2005, administered Propositions 13 and 50 grant and loan programs, and participated in development of the water management components of the Governor's Strategic Growth Plan. He has also served as an Assistant Director for the CALFED Bay-Delta Program. Cowin has worked at the Department of Water Resources for over 25 years. He received a B.S. in civil engineering from Stanford University.

**STEVEN DE GRYZE**

**UNIVERSITY OF CALIFORNIA, DAVIS**

Steven De Gryze is a post-doctoral researcher in

the Plant Sciences Department of the University of California, Davis, focusing on ecosystem sciences. De Gryze's past research activities included the mathematical description of soil aggregate dynamics, the use of X-ray tomography to investigate soil structure, and landscape inventories of soil carbon as affected by tillage intensity. His recent work includes the regional assessment of greenhouse gas mitigation potentials by alternative farming management practices in California, soil carbon dynamics at depth, and the development of soil organic matter models that use measurable instead of conceptual pools. De Gryze earned an M.S. in bio-science engineering from the Catholic University of Leuven, Belgium, in collaboration with the Natural Resource Ecology Laboratory in Fort Collins, Colorado; an M.S. in statistics from the Catholic University of Leuven, Belgium, and a Ph.D. in soil conservation from the Catholic University of Leuven, Belgium, in collaboration with University of California, Davis.

**MICHAEL DETTINGER**

**U.S. GEOLOGICAL SURVEY/SCRIPPS INSTITUTION OF  
OCEANOGRAPHY**

Michael Dettinger is a research hydrologist for the U.S. Geological Survey, Western Branch of Regional Research, and a research associate at Scripps Institution of Oceanography. Dettinger has monitored and researched water resources of the West for more than 20 years, with emphases on regional surface- and groundwater systems and on climatic influences on water resources. Dettinger, a Climate Change Advisor to the CALFED Bay-Delta Program, is on the Editorial Board of the 2007 CALFED State of Science Report, and a member of the external Science Steering Group for the federal Global Water Cycle Program. He has degrees from the University of California, San Diego, and the Massachusetts Institute of Technology, and a Ph.D. in atmospheric sciences from the University of California, Los Angeles.

**HADI DOWLATABADI**

**UNIVERSITY OF BRITISH COLUMBIA**

Hadi Dowlatabadi is Canada Research Chair and Professor in Applied Mathematics and Global Change, University of British Columbia. He is a University



Fellow at Resources for the Future and an Adjunct Professor at the Department of Engineering and Public Policy, Carnegie Mellon University. His academic research has focused on the link between humans and the environment and decision-making. He studies problems in technology choice, air quality, infectious and vector-borne diseases, energy policy, equity, and climate change. He is co-founder and Editor of the *Integrated Assessment Journal* and serves on the editorial boards of four other scientific periodicals. He is co-founder of Offsetters and a Director of Canadian Bioenergy Corporation. As a Rockefeller Foundation Warren Weaver Fellow, he co-created Leaders in Environment and Development. He received his B.Sc. in physics from Edinburgh University and his Ph.D. in physics from Cambridge University.

### **SAM EARMAN**

#### **DESERT RESEARCH INSTITUTE**

Sam Earman is an Assistant Research Professor in the Division of Hydrologic Sciences at Desert Research Institute in Reno, Nevada. Earman specializes in using natural tracers in investigations of hydrologic systems. His interests include potential impacts of climate change on groundwater and surface water systems, snowmelt contribution to groundwater recharge, stable isotope systematics of snow and snowmelt, the impact of carbon dioxide on evaporite mineral formation, and the influences of tectonics on groundwater quality. He received his Ph.D. in earth and environmental science from New Mexico Institute of Mining and Technology, his M.S. in water resources management from University of Nevada, Las Vegas, and his B.A. from Macalester College.

### **MARC L. FISCHER**

#### **LAWRENCE BERKELEY NATIONAL LABORATORY/ CALIFORNIA STATE UNIVERSITY, EAST BAY**

Marc L. Fischer earned his bachelor and doctoral degrees in physics from the Massachusetts Institute of Technology and the University of California, Berkeley, respectively. Fischer is currently a staff scientist in the Atmospheric Sciences Department at the Lawrence Berkeley National Laboratory and an adjunct professor in the Department of Geography and Environmental Studies at California State

University, East Bay. Fischer's research focuses on measurements and modeling of human, ecosystem, and atmosphere processes involving trace gases, with an emphasis on drivers of and feedbacks to global change. Fischer's recent work includes development of measurement systems for greenhouse and reactive trace gases, inventory-based mapping of fossil fuel carbon dioxide emissions in the continental United States, measurements of the terrestrial carbon cycle responses to climate and land management in the Southern Great Plains, and design and implementation of a measurement network to constrain California's greenhouse gas emissions.

### **REINHARD E. FLICK**

#### **CALIFORNIA DEPARTMENT OF BOATING AND WATERWAYS/SCRIPPS INSTITUTION OF OCEANOGRAPHY**

Reinhard E. Flick is the oceanographer at the California Department of Boating and Waterways and a research associate at Scripps Institution. Flick's professional career since 1978 involves academic research, administration, lecturing, consulting, and public service in oceanography and nearshore processes, including waves, tides, and coastal erosion. He serves as editor of *Shore & Beach*, the reviewed quarterly journal of the American Shore and Beach Preservation Association. Flick has served as an expert witness in tidal boundary disputes before the United States Supreme Court and the 200th District Court in Texas, and as a consulting expert in other litigation. He earned a B.S. degree in physics from the Cooper Union for the Advancement of Science and Art in New York and a Ph.D. in oceanography from Scripps Institution of Oceanography.

### **GUIDO FRANCO**

#### **CALIFORNIA ENERGY COMMISSION**

Guido Franco is the technical lead on climate change research for the California Energy Commission's Public Interest Energy Research (PIER) Program. Franco was the principal author of the Energy Commission's statewide inventory of greenhouse gas emissions. Franco led the development of a long-term research plan on climate change in 2003. He was a principal author of this plan, which is being implemented through the California Climate Change Center. Franco

provides technical leadership for this Center and works very closely with researchers at different institutions in California and outside the state. Franco is a certified engineer in California and received his M.S. from the University of California, Berkeley, in fluid mechanics and thermal sciences.

### **PATRICK GONZALEZ**

#### **THE NATURE CONSERVANCY**

A forest ecologist with field experience in Africa, North America, and South America, Patrick Gonzalez serves as Climate Change Scientist with The Nature Conservancy. He conducts applied research that addresses climate change impacts on ecosystems using field inventories and remote sensing, forest carbon sequestration, and measures to facilitate the adaptation of ecosystems and natural resource management practices to climate change. Gonzalez earned his Ph.D. from the University of California, Berkeley, followed by post-doctoral work at the Woods Hole Research Center and as an American Association for the Advancement of Science Fellow. His public service includes positions with the U.S. Geological Survey, the U.S. Agency for International Development, and the U.N. Development Program. Gonzalez is also a Returned Peace Corps Volunteer from Senegal, West Africa. He has served as a lead author and expert reviewer for the Intergovernmental Panel on Climate Change.

### **NICHOLAS GRAHAM**

#### **HYDROLOGIC RESEARCH CENTER/SCRIPPS INSTITUTION OF OCEANOGRAPHY**

Nicholas Graham has dual appointments at the Hydrologic Research Center (HRC) and with the Scripps Institution of Oceanography (SIO). He joined Scripps in 1987 and HRC in 2000. He obtained both his M.S. and Ph.D. from the University of California, Santa Barbara. Graham is currently assisting in the development of applications projects involving the use of climate change and seasonal climate forecast information in water resource management.

### **ODELLE HADLEY**

#### **SCRIPPS INSTITUTION OF OCEANOGRAPHY**

Odelles Hadley received her B.S. from The Evergreen State College in Olympia, Washington. During this

time, Hadley served as an intern for the Olympic Air Pollution Control Authority (OAPCA), where she maintained air quality stations and collected data on aerosol and ozone concentrations in the region. After receiving her B.S., Hadley worked for OAPCA as an Air Quality Specialist. In 2002, she was accepted to Scripps Institution of Oceanography as a graduate student researcher. She recently finished her fifth year of graduate studies. Hadley's research interests include the long-range transport of aerosols and BC (black carbon or soot), as well as measurements of BC concentrations in rain and snow and enhanced melt rate of snow due to enhanced BC concentrations.

### **HUGO HIDALGO**

#### **SCRIPPS INSTITUTION OF OCEANOGRAPHY**

Hugo Hidalgo is an Assistant Research Scientist at Scripps Institution of Oceanography. His interests are related to surface water hydrology, hydroclimate, climate change, climate variability, and paleoclimate. Hidalgo obtained his M.Sc. and Ph.D. from the University of California, Los Angeles. He received his B.S. from the University of Costa Rica. From August 2001 to January 2003, he was a Visiting Post-doctoral Researcher where he studied the impacts of climate change on the agriculture and economy of California's Central Valley. Between 2003 and 2006 Hidalgo was a Post-graduate Research Hydrologist leading studies on evapotranspiration and drought. Since February 2006, he has developed studies on statistical downscaling, drought, and detection and attribution of climate change.

### **ADAM HIRSCH**

#### **UNIVERSITY OF CALIFORNIA, IRVINE**

Adam Hirsch received his Ph.D. in 2001 from the Department of Earth System Science at the University of California, Irvine. For his dissertation, he developed an automated system to continuously monitor soil carbon dioxide concentrations and used it to study the sensitivity of boreal soil respiration to seasonal thawing. During a two-year postdoctoral appointment at the Woods Hole Research Center, he simulated the impact of Amazonian forest clearing and regrowth on the global carbon budget. Since 2003, Hirsch has worked in the Global Monitoring Division at National Oceanic and Atmospheric Administration's (NOAA) Earth

System Research Laboratory in Boulder, Colorado. His work combines measurement and modeling of greenhouse gases to quantify their atmospheric budgets and includes participation in the North American Carbon Program and the NOAA CarbonTracker project.

### **MARC HOSHOVSKY**

#### **CALIFORNIA DEPARTMENT OF FISH AND GAME**

Marc Hoshovsky is a senior biologist for the California Department of Fish and Game working on biodiversity policy and science. He enjoys exploring new and different habitats, both within California and elsewhere.

### **RICHARD HOWITT**

#### **UNIVERSITY OF CALIFORNIA, DAVIS**

Richard Howitt is a Professor of Agricultural and Resource Economics and Department Chair at the University of California, Davis. He has been a faculty member at UC Davis since 1975 and teaches courses in resource economics, economic theory, and operations research. Howitt's current research covers three areas: modeling the economic structure of land and resource use; using market mechanisms to allocate water resources; and analyzing the switch in investments and changes in institutions subject to dynamic stochastic inputs and irreversible costs or decisions. Current research includes optimal reservoir management given uncertain water supplies. Howitt serves on advisory boards for the California Department of Water Resources and U.S. Academy of Sciences.

### **MARK JACOBSON**

#### **STANFORD UNIVERSITY**

Mark Jacobson is a Professor of Civil and Environmental Engineering and Professor, by Courtesy, of Energy Resources Engineering at Stanford University, where he has been on the faculty since 1994. He is also Director of the Atmosphere/Energy Program. Jacobson develops and applies computer models to understand better the effects of air pollutants, particularly from energy-producing or consuming sources, on climate, air quality, and weather. His group also maps and analyzes wind and other renewable energy resources. To date, Jacobson has published two textbooks, *Fundamentals of Atmospheric Modeling* and *Atmospheric Pollution: History, Science, and Regulation*, and 75 peer-reviewed scientific journal articles. He recently received the 2005 American Meteorological Society Henry G. Houghton Award. Jacobson has a B.S. in civil engineering, an A.B. in economics, and an M.S. in environmental engineering from Stanford University and an M.S. and Ph.D. in atmospheric sciences from the University of California, Los Angeles.

*History, Science, and Regulation*, and 75 peer-reviewed scientific journal articles. He recently received the 2005 American Meteorological Society Henry G. Houghton Award. Jacobson has a B.S. in civil engineering, an A.B. in economics, and an M.S. in environmental engineering from Stanford University and an M.S. and Ph.D. in atmospheric sciences from the University of California, Los Angeles.

### **JULIA LAVE JOHNSTON**

#### **GOVERNOR'S OFFICE OF PLANNING AND RESEARCH**

Julia Lave Johnston is a Senior Planner at the State Clearinghouse and Planning Unit with the Governor's Office of Planning and Research (OPR), where she provides technical assistance to state, regional, and local government agencies on a wider range of planning and environmental issues. She also coordinates OPR's policy related to land use and development and serves as a liaison to state planning organizations. Johnston's experience in program and policy development focuses on land use and planning issues; citizen participation; community building; and collaborative decision-making. Before joining OPR, she was a Senior Policy Analyst at the California Research Bureau in the California State Library. She received a B.A. degree in English from the University of California, Berkeley, and an M.S. degree in community and regional planning from the University of Oregon.

### **DANIEL KAMMEN**

#### **UNIVERSITY OF CALIFORNIA, BERKELEY**

Daniel Kammen received his undergraduate degree in physics from Cornell, and his M.A. and Ph.D. in physics from Harvard University. He was a postdoctoral fellow at CalTech and at Harvard University. He was assistant professor and chair of the Science, Technology and Environmental Policy Program at the Woodrow Wilson School of Public Policy at Princeton University. His research interests include renewable energy systems, health and environmental impacts of energy generation and use, climate change, rural resource management, and international research and development policy. Kammen authored the proposal for the \$500 million/10-year Energy Biosciences Institute, aimed at developing improved and more sustainable

biofuels for worldwide use, and is on its executive committee. He is also the Director of the Renewable and Appropriate Energy Laboratory.

### **MICHAEL KLEEMAN**

**UNIVERSITY OF CALIFORNIA, DAVIS**

Michael Kleeman is a Professor in the Department of Civil and Environmental Engineering at the University of California, Davis. Kleeman's research is focused on urban and regional air pollution problems and their relationship with human health effects and visibility reduction. He has published numerous papers describing measurements and model calculations to better understand the dominant sources of air pollution in California. Many of his current projects are sponsored by the California Air Resources Board and the United States Environmental Protection Agency. He received his M.S. and Ph.D. from the California Institute of Technology.

### **NOAH KNOWLES**

**U.S. GEOLOGICAL SURVEY**

Noah Knowles is a Research Hydrologist with the U.S. Geological Survey (USGS). He has served as a postdoctoral researcher at SIO and a National Research Council Research Associate with the USGS. His research topics have included historical trends in precipitation form in the western United States, and the influence of projected climate change in California, including changes in snowpack, runoff timing, and Bay-Delta water quality. His research interests include continued hydrologic and estuarine model development, the role of vegetation in shaping the hydrologic response to climate change, and changes in estuarine water quality and spatial extent due to sea level rise. Knowles received his Ph.D. from Scripps Institution of Oceanography (SIO) in 2000, where his dissertation topic was *Modeling the Hydroclimate of the San Francisco Bay-Delta Estuary and Watershed*.

### **CHARLES D. KOLSTAD**

**UNIVERSITY OF CALIFORNIA, SANTA BARBARA**

Charles D. Kolstad, a former president of the Association of Environmental and Resource Economists, is a leading environmental economist specializing in uncertainty and learning in environmental regulation,

particularly as applied to climate change. He is a lead author for the Intergovernmental Panel for Climate Change, a member of the National Academy committee evaluating the U.S. Climate Change Research Program, and the author of numerous articles and books. He is a professor of environmental economics at the University of California, Santa Barbara, appointed in both the Bren School of Environmental Science & Management and the Department of Economics. He is also a University Fellow of Resources for the Future.

### **LAURIE KOTEEN**

**UNIVERSITY OF CALIFORNIA, BERKELEY**

Laurie Koteen is a doctoral student in the Energy and Resources Group at the University of California, Berkeley. Her research focuses on changes in the patterns and processes of terrestrial ecosystems in the context of global climate change and biological invasion. Her current study emphasizes the role of introduced grasses in California in changing ecosystem nutrient and energy flows in ways that affect climate change. Her interests include understanding ecosystems respond to climate change and biological invasion, ecosystem resistance and resilience to change, biodiversity loss, and feedbacks to global climate change. Her research draws primarily from the fields of biogeochemistry, biometeorology, and plant community ecology and relies on both observational and manipulative approaches.

### **CHARLES F. KRAUTER**

**CALIFORNIA STATE UNIVERSITY, FRESNO**

Charles F. Krauter is a professor of Soil and Water Science at the Department of Plant Science at California State University (CSU), Fresno. Since 1979, he has been teaching courses in agricultural water, soils, irrigation systems, soil and water management, and plant-water relationships. Prior to 1998, Krauter's research focused on the impact of agricultural practices on groundwater pollution. Since 1998, his research has focused on air quality and has garnered national acclaim. Krauter currently serves as an Air Quality Research Coordinator at the Center for Irrigation Technology at CSU, Fresno. He also works closely with the research staff at the Center for Irrigation



Technology on campus as the Coordinator of Agricultural Air Quality Projects, and his irrigation management experiments have achieved national recognition.

### MARTHA KREBS

#### CALIFORNIA ENERGY COMMISSION

Martha Krebs is Deputy Director of the California Energy Commission's Energy Research and Development Division, which is responsible for the Public Interest Energy Research (PIER) Program. Before coming to the Energy Commission, Krebs was President of Science Strategies, an analysis and consulting firm that identifies critical science and technology issues and opportunities. She was the founding Director of the California NanoSystems Institute at the University of California. Earlier, Krebs was a Senior Fellow at the Institute for Defense Analysis. From 1993–2000, Krebs served as Assistant Secretary and Director of the Office of Science at the Department of Energy (DOE) and was responsible for the Department's \$3.5 billion basic research program. Krebs has served as an Associate Director for Planning and Development at DOE's Lawrence Berkeley National Laboratory and on the House Committee on Science. She received her B.S. and Ph.D. in physics from the Catholic University of America.

### HAL LAFLASH

#### PACIFIC GAS AND ELECTRIC COMPANY

Hal LaFlash is the director of emerging clean technology policy in the energy procurement organization at Pacific Gas and Electric Company (PG&E). Among other duties, he assesses the state of technologies that affect how PG&E will fill its future resource needs, which includes understanding, evaluating, and supporting emerging renewable energy and other clean energy technologies. LaFlash has worked 27 years at PG&E, where he has held various positions in energy efficiency, non-utility generation, gas transportation, and resource planning. He also held positions at PG&E Corporation in corporate development and business planning. LaFlash was a member of the Solar Task Force of the Western Governors Association's Clean and Diversified Energy Initiative. He co-authored *Hedging Carbon Risk:*

*Protecting Customers and Shareholders from the Financial Risk Associated with Carbon Dioxide Emissions*, which was published by *The Electricity Journal*. LaFlash has a B.S. in mechanical engineering and a Masters in business administration.

### ALAN D. LAMONT

#### LAWRENCE LIVERMORE NATIONAL LABORATORY

Alan Lamont has been an engineer with Lawrence Livermore National Laboratory (LLNL) for the past 20 years. He has developed and applied a software system for building and running large energy economics models. His research focuses on modeling the economics of energy systems and energy technologies. Lamont has also conducted risk and decision analyses for nuclear and infrastructure security systems. At LLNL he has developed and presented courses on probability analysis and decision analysis. Prior to coming to LLNL he analyzed the risks of failure in pipelines in permafrost, underground storage tanks, and hazardous waste facilities. Lamont holds a Ph.D. in engineering economic systems and an M.S. in civil engineering from Stanford University.

### L. RUBY LEUNG

#### PACIFIC NORTHWEST NATIONAL LABORATORY/ NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

Ruby Leung is a Laboratory Fellow at the Pacific Northwest National Laboratory and an Affiliate Scientist at the National Center for Atmospheric Research (NCAR). Leung's primary research focus is on regional climate modeling. She and her colleagues developed a regional climate model with special features that account for the subgrid-scale effects of topography, lakes, and vegetation. Her model enables the coupling of climate and hydrologic processes in regions with complex orography. Leung has led several multidisciplinary projects to examine the impacts of climate variability and change and the effects of aerosols on the regional hydrological cycle. She is working with collaborators at NCAR to develop regional climate modeling capability with the Weather Research and Forecasting (WRF) model. She received her M.S. and Ph.D. in Atmospheric Science from Texas A&M University.

**CHANGSHENG LI****UNIVERSITY OF NEW HAMPSHIRE, DURHAM**

Changsheng Li is a Research Professor at the Institute for the Studies of Earth, Oceans, and Space and at the Department of Natural Resources, both at the University of New Hampshire, Durham. Li has coordinated and participated in agricultural greenhouse gas-related research projects supported by U.S. government agencies from 1989 to the present. Major projects included “Quantifying Atmospheric Impacts of Rice Agriculture in Asia” (1995–2005); “Development of a Process-based Model for Predicting C Sequestration and Trace Gas Emissions in Forest Ecosystems” (1998–2006); and “Development of Process-based Model for Predicting Trace Gas Emissions from Dairy Farms in the U.S.” (2004–2006). Li earned a B.S. in geochemistry, an M.S. in environmental chemistry, and a Ph.D. in biogeochemistry.

**AMY LYND LUERS****UNION OF CONCERNED SCIENTISTS**

Amy Lynd Luers manages the Union of Concerned Scientists’ California climate change program, which is aimed at strengthening support for strong state and regional climate policies. As a member of the California Climate Action Team’s Subcommittee on Climate Science, she works with the state California Climate Change Center on designing and synthesizing climate impact studies. Her research and publications have focused on issues of vulnerability and adaptive capacity to global environmental changes in the United States and Latin America. Luers holds a Ph.D. in environmental science and an M.A. in international policy studies, both from Stanford University, and a B.S. in environmental resources engineering from Humboldt State University.

**ERIC MASANET****LAWRENCE BERKELEY NATIONAL LABORATORY**

Eric Masanet is a researcher in the Energy Analysis Department at Lawrence Berkeley National Laboratory (LBNL). His current research areas at LBNL include modeling of industrial energy use and greenhouse gas emissions, industrial energy efficiency improvement analysis, and product life-cycle assessment. He also

serves as Program Manager for the Engineering and Business for Sustainability Certificate Program at the University of California (UC) Berkeley. Most recently, Masanet co-lead research efforts for a U.S. Environmental Protection Agency report to Congress on the energy efficiency potential of the nation’s data centers. He holds a Ph.D. in mechanical engineering from UC Berkeley, with a specialization in green design and manufacturing.

**NICHOLAS MARTIN****WINROCK INTERNATIONAL**

Nicholas Martin is a Program Officer in Forestry, Energy & Ecosystem Services for Winrock International. Martin manages terrestrial carbon sequestration and emission reduction activities under the West Coast Regional Carbon Sequestration Partnership, including reforestation, forest management, fire management, and biomass energy. He is working with the U.S. Forest Service, state agencies, the forest and energy industries, landowners and non-governmental organizations on climate change mitigation/adaptation activities throughout California and the western United States. He leads forest carbon measurement, monitoring, and verification activities, and serves as a third-party verifier for the California Climate Action Registry and Chicago Climate Exchange. Martin coordinates biomass power and biofuels initiatives at Winrock, including feedstock supply assessments, biomass from hazardous forest fuels, co-firing biomass in coal-fired power plants, conventional and cellulosic biofuels, international bioenergy collaboration, and linkages to terrestrial and geologic sequestration. He received his M.S. in Energy and Resources from the University of California, Berkeley.

**MICHAEL MASTRANDREA****STANFORD UNIVERSITY**

Michael D. Mastrandrea is a Research Associate at the Center for Environmental Science and Policy at Stanford University, and is a Lecturer in the Interdisciplinary Graduate Program in Environment and Resources. Mastrandrea’s research focuses on the physical, biological, and societal impacts of climate change and policy strategies for reducing climate

risks. His work has been published in several journals, including *Science* and *Proceedings of the National Academy of Sciences*, and he is an author for chapters assessing key vulnerabilities and climate risks, and long-term mitigation strategies for the Intergovernmental Panel on Climate Change Fourth Assessment Report. He also serves on the Editorial Board for the journal *Climatic Change*.

### **EDWIN MAURER**

#### **SANTA CLARA UNIVERSITY**

Edwin Maurer is on the faculty of the Civil Engineering Department at Santa Clara University in California, where he teaches hydraulics, hydrology, and spatial analysis and conducts research related to large-scale hydrologic dynamics, potential improvements in long-lead forecasting, and regional hydrologic effects of climate change. Previously, he worked at the University of Washington, studying hydrology at a variety of temporal and spatial scales. His 20 years of research, consulting, and international work has focused on areas of surface water hydrology, sediment transport, municipal water supply and wastewater engineering, water rights studies, and rural community water supply projects in less-developed countries. Maurer holds a B.S. in civil and environmental engineering from the University of Rhode Island, an M.S. in civil engineering from the University of California, Berkeley, and a Ph.D. in civil and environmental engineering from the University of Washington.

### **NORM MILLER**

#### **LAWRENCE BERKELEY NATIONAL LABORATORY/ UNIVERSITY OF CALIFORNIA, BERKELEY/ BERKELEY WATER CENTER**

Norm Miller is a Staff Hydrometeorologist in the Climate Science Department at Lawrence Berkeley National Laboratory; Adjunct Professor in the Geography Department, University of California at Berkeley; and Associate Director of the Berkeley Water Center. His research includes analyzing atmosphere and land surface-subsurface processes at a range of scales, evaluating climate change impacts, and advancing new concepts for climate simulations. Miller has published more than 65 peer-reviewed journal papers and book chapters, is a contributing author

of the Intergovernmental Panel for Climate Change Second, Third, and Fourth Assessment Reports, and the Southwestern United States and California Assessment Reports. He serves as an adviser and committee member to the California Energy Commission, California Department of Water Resources, Regional Water Quality Control Board, Pacific Gas and Electric, San Francisco Public Utilities Commission, Dutch Water Ministry, NASA and NOAA climate and hydrology committees, and the GEOSS Integrated Water Cycle Observations Partnership.

### **NEHAZAT MOTALLEBI**

#### **CALIFORNIA AIR RESOURCES BOARD**

Nehzat Motallebi is staff air pollution specialist in the Research Division of the California Air Resources Board (ARB). Motallebi's primary responsibility at ARB includes managing research projects in the field of particulate matter monitoring, data analysis, and regional air quality modeling. She is also managing several research projects on the global radiative effect of particulate black carbon, improving the carbon dioxide emission estimates from the combustion of fossil fuels in California, and the impact of climate change on meteorology and regional air quality in California. She has a Ph.D. in atmospheric science from the University of California, Davis.

### **JOAN M. OGDEN**

#### **UNIVERSITY OF CALIFORNIA, DAVIS**

Joan Ogden is Professor of Environmental Science and Policy at the University of California, Davis, and Co-Director of the Sustainable Transportation Energy Pathways Program at the campus' Institute of Transportation Studies. Her primary research interest is the technical and economic assessment of new energy technologies, especially alternative fuels; fuel cells; renewable energy; and energy conservation. Her recent work centers on the use of hydrogen as an energy carrier, hydrogen infrastructure strategies, and applications of fuel cell technology in transportation and stationary power production. Prior to joining the faculty at UC Davis, Ogden was a research scientist in the Energy Group at Princeton University's Environmental Institute. She holds a B.S. in mathematics from the University of Illinois and a

Ph.D. in theoretical physics from the University of Maryland.

### JOSEPH O'HAGAN

#### CALIFORNIA ENERGY COMMISSION

Joseph O'Hagan is a Technical Research Manager with the California Energy Commission's Public Interest Energy Research (PIER) Program-PIER Environmental Area. O'Hagan is the PIER technical lead for research on water and energy. He received a B.S. from California State University, San Diego, and an M.S. from California Polytechnic State University, San Luis Obispo.

### JENNIFER PENNEY

#### CLEAN AIR PARTNERSHIP

Jennifer Penney, Sc.D., is the Director of Research for The Clean Air Partnership, an environmental organization that works with more than 20 local governments in the Greater Toronto Area on air pollution and climate change issues. She is the co-author of several recent studies on climate change impacts and adaptation. Her presentation is based on case studies of six cities in the United States, Canada, and the United Kingdom that have begun to develop and implement adaptation programs to reduce the growing impacts of climate change.

### HUGH PITCHER

#### PACIFIC NORTHWEST NATIONAL LABORATORY

Hugh Pitcher is a staff scientist with the Joint Global Change Research Institute (JGCRI). In 15-plus years with the JGCRI, he has played a major role in developing the Second Generation Model (SGM) and integrating the Edmonds-Reilly-Barnes emissions model with Model for the Assessment of Greenhouse-gas Induced Climate Change (MAGICC). He has also worked on the Intergovernmental Panel on Climate Change's (IPCC) *Special Report on Emission Scenarios*. He continues to serve the IPCC as a member of the Technical Group on Data and Scenarios for Impacts and Climate Assessment, and as a contributing author to the Fourth Assessment Report. Pitcher's current interests include continued development of long-term scenarios, focused on major revisions to the

demographics models and work on health, climate, and economic growth, as well as extending the JGCRI's integrated assessment models to include water and impacts.

### CHRISTOPHER POTTER

#### NASA AMES RESEARCH CENTER

Christopher Potter is a Senior Research Scientist in the Biospheric Sciences Branch at the National Aeronautics and Space Administration (NASA) Ames Research Center. He came to NASA Ames Research Center in 1990 as a National Research Council (NRC) Associate Fellow. Potter and his colleagues were awarded NASA's Public Service Medal for development of the first computer model for global ecosystem exchange of all major biogenic trace gases with the atmosphere. He is the author of more than 60 peer-reviewed journal articles and book chapters. In 2007, Potter was selected as a NASA Ames Associate Fellow in recognition of exceptional scientific research achievement. He holds Ph.D. and a M.Sc. in forest ecology from Emory University.

### FRED MARTIN RALPH

#### NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION/EARTH SYSTEM RESEARCH LABORATORY

Fred Martin Ralph is a research meteorologist who has studied phenomena that cause variations in daily weather and how these variations are affected by short-term climate variability. Currently, he is the Program Manager of the National Oceanic and Atmospheric Administration's (NOAA) Weather & Water/Science, Technology and Infusion Program and Chief of the Water Cycle Branch at NOAA's Earth System Research Laboratory/Physical Sciences Division. A key area of expertise is exploring how to best observe the atmosphere, with an emphasis on what observations and physical understanding are needed to improve precipitation forecasts. Ralph has worked closely with the operational weather forecasting community to develop new forecasting techniques based on better physical understanding of the weather and on better use of observations to guide predictions.



**KELLY T. REDMOND****DESERT RESEARCH INSTITUTE**

Kelly T. Redmond is the Regional Climatologist and Deputy Director at the Western Regional Climate Center located at the Desert Research Institute in Reno, Nevada. He worked in the Atmospheric Sciences Department at Oregon State University from 1982–1989, the last six years as State Climatologist for Oregon, and served as President of the American Association of State Climatologists in 1989–1990. His research and professional interests span every facet of climate and climate behavior, its physical causes and variability, how climate interacts with other human and natural processes, and how such information is acquired, used, communicated, and perceived. He received a B.S. degree in physics from the Massachusetts Institute of Technology, and M.S. and Ph.D. degrees in meteorology from the University of Wisconsin in Madison.

**LYDIA RIES****UNIVERSITY OF CALIFORNIA, SANTA BARBARA**

Lydia Ries is a post-doctoral research scientist at the Bren School of Environmental Science and Management at the University of California, Santa Barbara. Her dissertation research explored nutrient and light limitations on vegetation in the savannas of southern Africa. She spent part of her graduate career in Zambia, Botswana, and South Africa collecting field measurements and collaborating with the University of Botswana and the South African National Biodiversity Institute. She is working on predicting shifts in species ranges under various climate change scenarios. Lydia Ries received her Ph.D. from the University of Virginia's Department of Environmental Sciences.

**ARTHUR H. ROSENFELD****COMMISSIONER, CALIFORNIA ENERGY COMMISSION**

Arthur Rosenfeld received his Ph.D. in physics in 1954 at the University of Chicago under Nobel Laureate Enrico Fermi, and then joined the Department of Physics at the University of California at Berkeley. There he joined, and eventually led, the Nobel prize-winning particle physics group of Luis Alvarez at Lawrence Berkeley National Laboratory (LBNL) until 1974. At that time, he changed his research focus to the

efficient use of energy, formed the Center for Building Science at LBNL, and led it until 1994.

From 1994–1999 Rosenfeld served as Senior Advisor to the U. S. Department of Energy's Assistant Secretary for Energy Efficiency and Renewable Energy. In 2000, California Governor Gray Davis appointed him to the California Energy Commission and in 2005, Governor Arnold Schwarzenegger reappointed him. He is responsible for the Public Interest Energy Research program, with an annual budget of \$82 million, and for energy efficiency, including the California energy efficiency standards for buildings and for appliances. He is also the Assigned Commissioner to collaborate with the Public Utilities Commission Proceeding on demand response, critical peak pricing, and advanced metering, and the Proceeding on Energy Efficiency Programs, with an annual budget of \$600 million.

He is the author or co-author of nearly 400 refereed publications, received the Szilard Award for Physics in the Public Interest in 1986, the Carnot Award for Energy Efficiency from the U.S. Department of Energy in 1993, and the Berkeley Citation in 2001 from the University of California. In 2006, he received the Enrico Fermi Award from the U.S. Department of Energy for a lifetime of achievement ranging from pioneering scientific discoveries in experimental nuclear and particle physics to innovations in science, technology, and public policy for energy conservation that continue to benefit humanity. As one Enrico Fermi's last graduate students, Rosenfeld feels that this honor is particularly important and meaningful.

**ALAN SANSTAD****LAWRENCE BERKELEY NATIONAL LABORATORY**

Alan H. Sanstad is a Staff Scientist in the Environmental Energy Technologies Division at the Lawrence Berkeley National Laboratory. Sanstad received an A.B. degree in applied mathematics, and M.S. and Ph.D. degrees in operations research, from the University of California at Berkeley. His research and publications have included work on the economics and policy analysis of end-use energy efficiency, technological change in energy-economic simulation modeling, and integrated assessment of global climate



change. His recent work has focused on developing new approaches to long-run quantitative modeling and decision-making pertaining to energy system transitions, large-scale greenhouse gas abatement, and other issues in the energy, environmental, and technology policy arenas. Sanstad has worked with the U.S. Environmental Protection Agency, the California Energy Commission, the U.S. Department of Energy, and nongovernmental organizations in developing and implementing research strategies, policies, and projects.

### **BENJAMIN DAVID SANTER**

#### **LAWRENCE LIVERMORE NATIONAL LABORATORY**

Benjamin Santer is an atmospheric scientist at Lawrence Livermore National Laboratory's (LLNL) Program for Climate Model Diagnosis and Intercomparison. His research focuses on such topics as climate model evaluation, the use of statistical methods in climate science, and identification of natural and anthropogenic "fingerprints" in observed climate records. His early research on the climatic effects of combined changes in greenhouse gases and sulfate aerosols contributed to the historic "discernible human influence" conclusion of the 1995 Report by the Intergovernmental Panel on Climate Change. His recent work has attempted to identify anthropogenic fingerprints in a number of different climate variables, such as tropopause height, the temperature of the stratosphere and troposphere, and ocean surface temperatures in hurricane formation regions. Santer holds a Ph.D. in Climatology from the University of East Anglia, England. Previously, he worked at the Max-Planck Institute for Meteorology on the development and application of climate fingerprinting methods.

### **JAYANT SATHAYE**

#### **LAWRENCE BERKELEY NATIONAL LABORATORY**

Jayant Sathaye is a Senior Scientist and Leader in the International Energy Studies Group at Lawrence Berkeley National Laboratory. His current research interests include global model development to evaluate the costs and potentials of energy and land use mitigation options, indicators of energy efficiency, and energy efficiency promotion in India. Sathaye has been published in major energy and environment

journals. He has been a Convening Lead Author, Section Leader, and Principal Lead Author of seven publications of the Intergovernmental Panel on Climate Change (IPCC) since 1990. He also contributed to the IPCC Fourth Assessment Report. He holds a B.Tech. (Hons.) degree from the Indian Institute of Technology, Bombay, and a Ph.D. from the University of California, Irvine.

### **STEVEN R. SCHILLER**

#### **UNIVERSITY OF CALIFORNIA OFFICE OF THE PRESIDENT**

Steve Schiller is a Senior Advisor at the University of California's California Institute for Energy and Environment and the University of California (UC), Davis, Energy Efficiency Center. He has 30 years of experience in domestic and international energy sector-related management, consulting, and research. His current efforts include a University of California program on energy efficiency and long-term climate change mitigation strategies, a National Action Plan for Energy Efficiency project on documenting energy savings and avoided emissions from energy efficiency, a similar effort in China, and an Energy Foundation-funded effort to study policy options for incorporating efficiency into climate regulation. He is also Vice Chairman of the California Climate Action Registry Board of Directors. Schiller holds B.A. and M.A. degrees in mechanical engineering from the University of Michigan and University of California, Berkeley.

### **STEVE SHAFFER**

#### **CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE**

Steve Shaffer is Director of the California Department of Food and Agriculture's (CDFA) Office of Agriculture and Environmental Stewardship, a position he has held since November 2000. The office addresses environmental issues related to agriculture using a multidisciplinary approach. Shaffer, a 12-year veteran with the CDFA, represents the agency on a number of environmental, energy, and natural resource management planning, implementation, and monitoring activities as they relate to agriculture. He currently serves on the Delta Protection Commission, the board of the California Biomass Collaborative, the Interagency Bioenergy Workgroup, and the Climate Action Team. He has represented CDFA on the last

three updates of the State Water Plan and has been involved in land use, air, water, energy, and wildlife policy related to agriculture, including the support of biofuels, since 1981. Shaffer graduated the University of California, Santa Barbara, with a degree in biochemistry/molecular biology.

### REBECCA SHAW

#### THE NATURE CONSERVANCY/CARNEGIE INSTITUTION'S DEPARTMENT OF GLOBAL ECOLOGY

Rebecca Shaw is the Director of Conservation Science for The Nature Conservancy (TNC) and Visiting Scientist at the Carnegie Institution's Department of Global Ecology at Stanford University. As Director of Conservation Science, she incorporates the best available scientific information into the full array of TNC programs and manages an interdisciplinary team of scientific and technical experts. Through partnerships with academics and government agency partners, her team's research projects focus on incorporating climate change impacts and economic return into conservation priority setting and conservation planning for ecosystem services, marine systems, and migratory species. Prior to joining TNC, she conducted research at the Department of Global Ecology on the impacts of global change on ecosystems processes and biodiversity. She received her M.A. in environmental policy and her Ph.D. in energy and resources from the University of California at Berkeley.

### STEVEN J. SMITH

#### JOINT GLOBAL CHANGE RESEARCH INSTITUTE

Steven J. Smith is a scientist at the Joint Global Change Research Institute (a collaboration of the Pacific Northwest National Laboratory and the University of Maryland). His research focuses on long-term socioeconomic scenarios and the interface between socioeconomic systems and the climate system in the areas of aerosols/greenhouse gases, energy efficiency, renewable energy, the carbon-cycle, and land-use changes. Recent research includes examination of the role of non-carbon dioxide forcing agents in policy scenarios and analysis of the role of renewable energy and energy efficiency in meeting greenhouse gas emission goals. He was a lead author for the Intergovernmental Panel on Climate Change Special

Report on Emissions Scenarios. He received his Ph.D. in physics from the University of California at Los Angeles.

### WILLIAM J. SYDEMAN

#### POINT REYES BIRD OBSERVATORY

William J. Sydeman is Director of Marine Ecology at Point Reyes Bird Observatory Conservation Science. Since 1986, Sydeman has studied marine birds, marine mammals, fish, and plankton in the North Pacific, with emphasis on the California Current large marine ecosystem. The majority of his research focuses on the biological consequences of gradual and abrupt climate change, ecosystem-based fisheries management, integrated ecosystem assessments, and pelagic marine protected area design.

### LAURIE TEN HOPE

#### CALIFORNIA ENERGY COMMISSION

Laurie ten Hope manages the Energy Systems Research Office at the California Energy Commission. She leads a multi-disciplinary team in the development of public interest research initiatives to understand and mitigate energy related environmental impacts; improve electricity infrastructure efficiency and reliability, and develop transportation alternatives. She served for six years as Advisor to two Energy Commissioners providing advice on economic and environmental impacts of programs and legislation. Previously, ten Hope supervised the Commission's building efficiency standards' training and education programs. Prior to joining the Commission, she held various commercial energy efficiency positions at Pacific Gas & Electric Company. ten Hope serves on the Advisory Board of the Center for the Study of Energy Markets and is a member of Women Energy Associates. She has a B.A. in Environmental Science from the State University of New York.

### ROB TRAUTZ

#### WEST COAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP/LAWRENCE BERKELEY NATIONAL LABORATORY

Rob Trautz is the technical manager for the West Coast Regional Carbon Sequestration Partnership (WESTCARB) carbon dioxide (CO<sub>2</sub>) sequestration

pilot projects, including the Rosetta Resources CO<sub>2</sub> Storage Project and Arizona Utilities CO<sub>2</sub> Storage Pilot. He is a researcher at Lawrence Berkeley National Laboratory with 25 years of experience in hydrogeologic and geophysical field and laboratory investigations. His research interests include developing innovative field and laboratory testing, sampling, and analysis techniques, designed to address challenging problems involving high-level radioactive waste storage, bioremediation of contaminated groundwater, and geologic carbon sequestration. He is a member of the highly successful research team that designed and implemented the Frio Brine Experiment, a small-scale CO<sub>2</sub> injection project in Texas. He earned a B.S. in geology from Michigan State University and a M.S. in hydrology from the University of Arizona.

#### **RICHARD A. (TONY) VANCUREN** CALIFORNIA AIR RESOURCES BOARD

VanCuren is a physical geographer who has studied air pollution—especially long range transport of aerosols—for nearly 30 years. Educated at the University of California, Riverside, and the University of California, Davis (where he received his Ph.D.), his academic training emphasized climatology and regional- to global-scale impacts of humans on the environment. His research on aerosols began in 1978 and has continued since joining the California Air Resources Board Research Division in 1985. He has worked on problems ranging from visibility in National Parks to road dust impacts on Lake Tahoe. His current research includes intercontinental pollution transport between Asia and North America and using ambient measurements to estimate regional non-carbon dioxide greenhouse gas emissions.

#### **SEBASTIAN VICUÑA** UNIVERSITY OF CALIFORNIA, BERKELEY

Sebastian Vicuña is a Ph.D. student working with Professor John Dracup in the Department of Civil and Environmental Engineering at the University of California, Berkeley. His research is focused on the impact of climate change on California hydrology and water resources. Vicuña has studied the effects of climate change on high-elevation hydropower

generation, water use in the agriculture sector, and the conjunctive use of surface water and ground water as a climate change strategy in California. His B.S. degree is in environmental engineering from the Catholic University of Santiago, Chile, and at UC Berkeley he earned two M.S. degrees—one in public policy from the Goldman School of Public Policy and one in civil and environmental engineering.

#### **JOHN WEYANT** STANFORD UNIVERSITY

John Weyant is currently an adviser to the U.S. Department of Energy, Pacific Gas & Electric Company, and the U.S. Environmental Protection Agency. He came to Stanford University in 1977, primarily to help develop the Energy Modeling Forum. Weyant was formerly a Senior Research Associate in the Department of Operations Research, a member of the Stanford International Energy Project, and a Fellow in the U.S.-Northeast Asia Forum on International Policy. His current research is focused on global climate change, energy security, corporate strategy analysis, and Japanese energy policy. He is on the editorial boards of *The Energy Journal*, and *Petroleum Management*. Weyant earned his Ph.D. from the University of California, Berkeley.

#### **DOUGLAS WICKIZER** CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION

Douglas Wickizer is Department Chief for Environmental Protection, Regulation, and Forest Product Utilization for the California Department of Forestry and Fire Protection (CDF), where he has worked since 1973 in a variety of positions. The Department's interests and efforts in biomass utilization and global climate change are a portion of his work. Wickizer has contributed to the success of numerous projects, including major revisions of the Forest Practice Rules, completion of the initial Soil Erosion Study, establishment of the original Board Monitoring Study Group, and design and preparation of the 1996 California Fire Plan. He contributed to the 2004 Fire and Resource Assessment Program report and to the current Forestry Protocols for the California

Climate Action Registry. Recently, Wickizer was appointed to the Board of Directors for the California Biomass Collaborative and is a member of the California Bio-Energy Interagency Working Group. He continues to represent both the Department and the Board of Forestry and Fire Protection in climate change activities and initiatives. Wickizer earned a B.S. in Forest Land Management from Northern Arizona University.









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